F·A·A·M facility for airborne atmospheric measurements

FLIGHT FOLDER

Flight No.:	B111
Date:	14 Jul 2005
Take Off	08:36:03
Landing:	13:16:32
Flight Time	4h40m29s

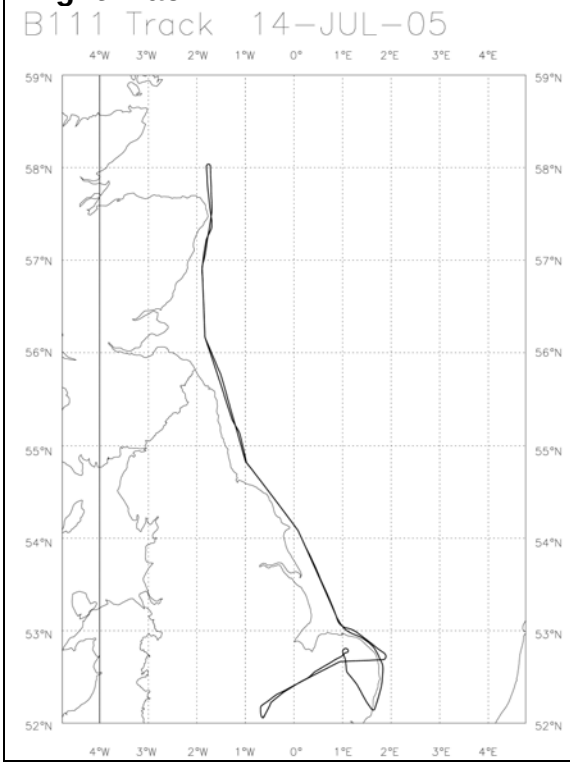
Campaign: AMPEP

Trials Instructions:

Operating Area: Norfolk to Scotland east coast

POB	Position	Name	Institute
1	Captain	Alan Foster	Directflight
2	Co-pilot	Alan Roberts	Directflight
3	CCM	Sue Angold	Directflight
4	Mission Scientist	David Fowler	CEH
5	Flight Manager	Jim Crawford	FAAM
6	CCM2/Filters	Paul James	FAAM
7	Cloud Physics	Martyn Pickering	Met Office
8	AMS	Paul Williams	Manchester University
9	AMS training	Gerrard Capes	Manchester University
10	Core chem / TDLAS	Ruth Purvis	FAAM
11	Core Chem training	Maureen Smith	FAAM
12	PAN/WAS	Maria Nielsdottir	UEA
13	Bags 1	Alan McDonald	CEH
14	Bags 2	Mark Theobald	CEH
15	Ptr-MS	Anne Hulse	UEA
16	Ptr-MS training	Jennifer Murphy	UEA
17	NOxy	Dave Stewart	UEA
18			
19			
20			

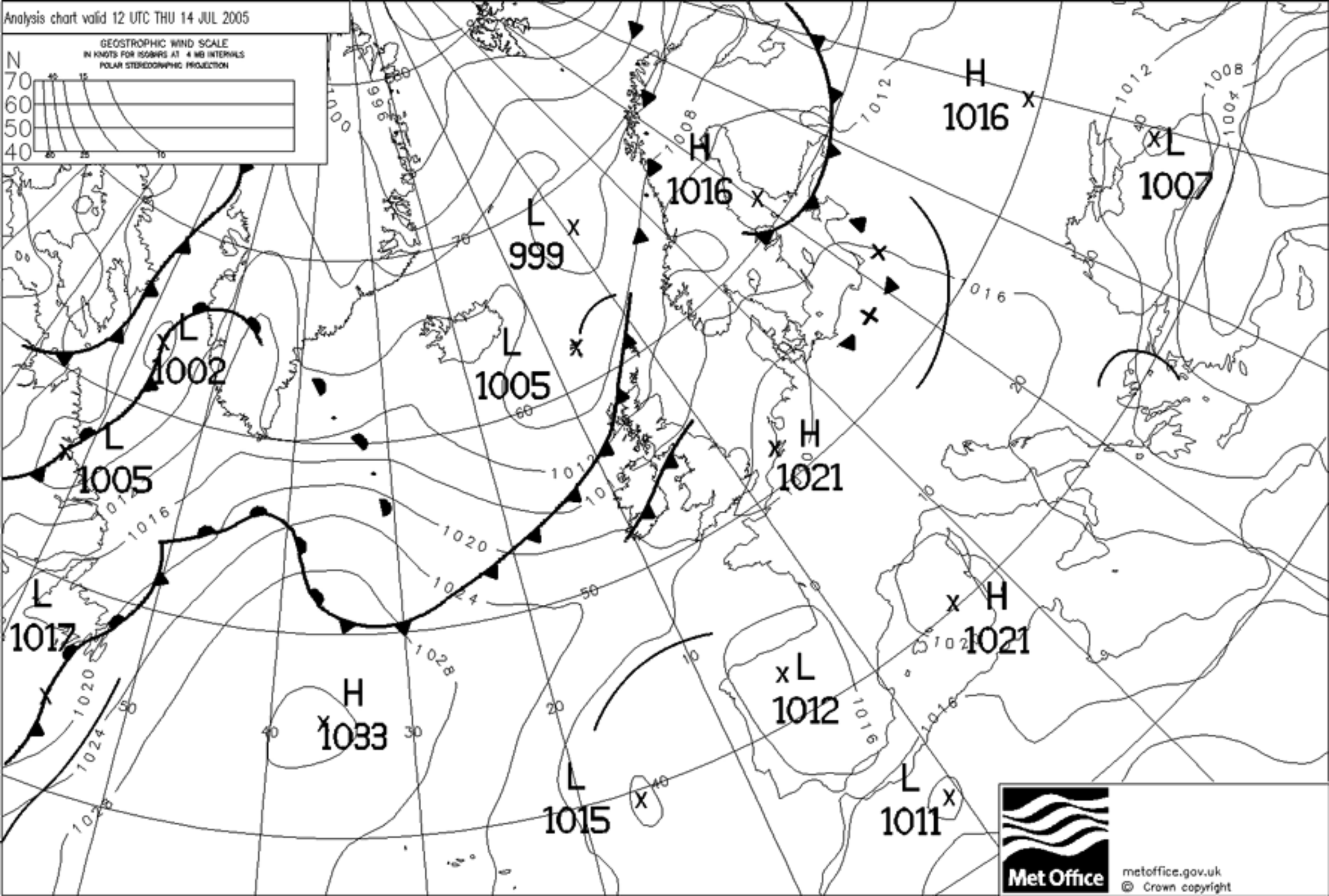
Flight Track:



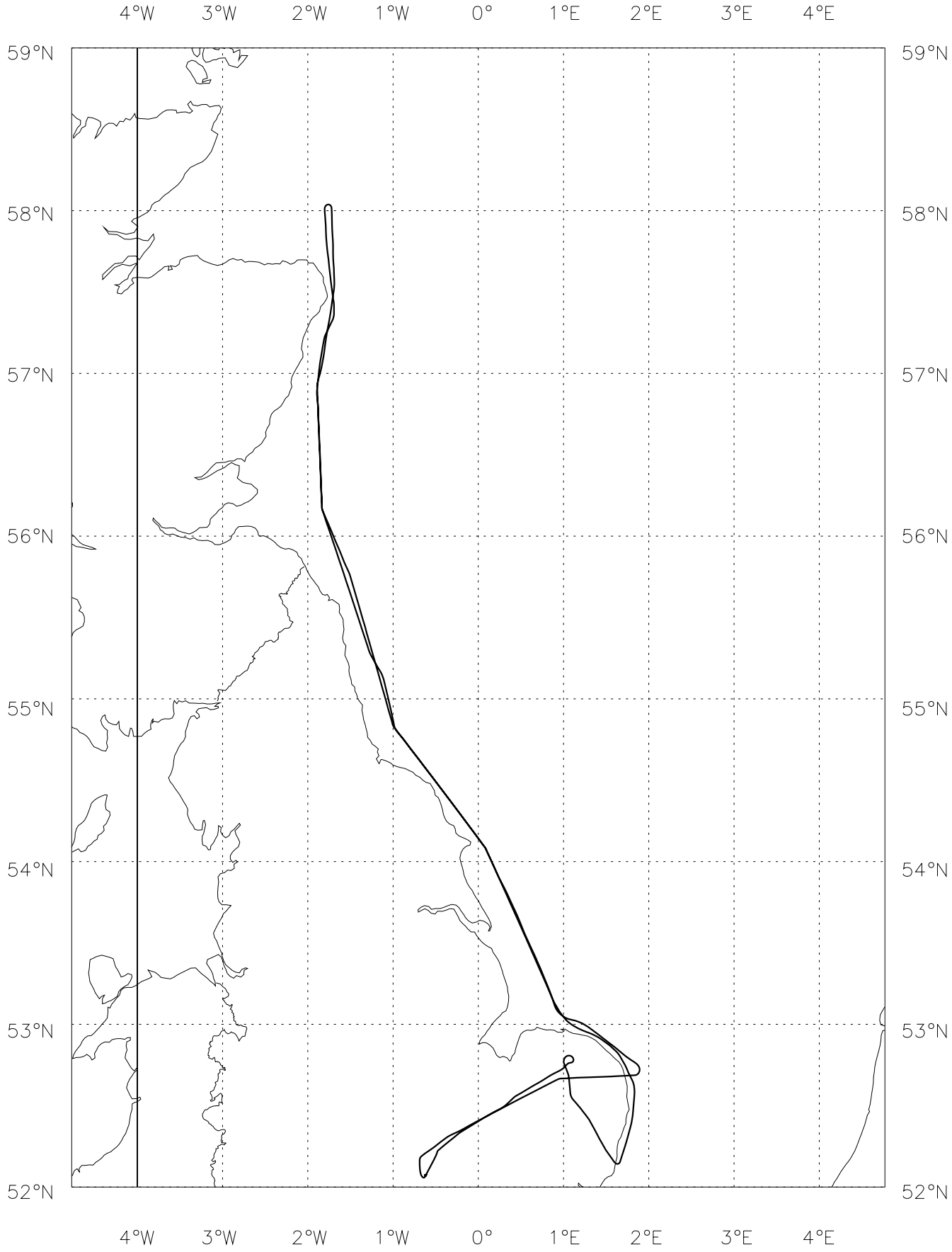
FLIGHT SUMMARY

Flight No b111
Date: 14 Jul 05
Project: AMPEP
Location: east coast

Start Time	End Time	Event	Height (s)	Hdg	Comments
081308		INU to nav	0.14 kft	127	gps 52'04.36N 000'37.48W
082704		start & power c/o	0.14 kft	127	
082827		taxy	0.14 kft	129	
083603		T/O Cranfield	3.9 kft	359	08:36:03
084009		asps open	5.0 kft	058	
084117		video recording star	5.0 kft	055	FFC & DFC
084155		ams logging rosemoun	6.3 kft	057	
084441	090100	Run 1	10.0 kft	063	fl100 cals stop at WP 40
085110		nev cal	10.0 kft	065	fl100
090307	090641	Profile 1	9.5 - 6.0 kft	297	10000-6000ft
090641	090752	Run 2	6.0 - 5.9 kft	300	run 2 fl60
090752	090934	Profile 2	5.9 - 4.0 kft	301	fl60-40
090934	091027	Run 3	4.0 kft	297	fl40
091028	091237	Profile 3	4.0 - 2.0 kft	288	
091238	091332	Run 4	2.0 kft	295	run 4 2000'
091333	091453	Profile 4	2.0 - 0.80 kft	310	
091453	091548	Run 5	0.80 - 0.81 kft	337	run 5 1000'
091548	091727	Profile 5	0.81 - -.09 kft	335	
091727	091833	Run 6	-.09 - -.01 kft	332	run 6 100'
091943	092140	Run 7	0.81 - 0.79 kft	332	run 7 1000' ams crash
092926	104250	Run 8	0.79 - 0.94 kft	331	1000'
093300		waypoint 80	0.79 kft	317	
094930		waypoint 79	0.82 kft	335	
100534		waypoint 77	0.88 kft	335	718nm N of Paris
101300		waypoint 76	0.89 kft	341	
103209		waypoint 75	0.94 kft	009	
104456	104543	Run 9	0.09 - 0.12 kft	176	run 9 100ft
104544	104621	Profile 6	0.12 - 0.50 kft	178	
104622	104711	Run 10	0.50 - 0.53 kft	180	run 10 500ft
104711	104754	Profile 7	0.53 - 0.96 kft	181	
104754	104846	Run 11	0.96 - 0.95 kft	179	run 11 1000ft
104846	104946	profile 8	0.95 - 1.9 kft		
104946	105051	Run 12	1.9 kft	178	run 12 2000ft
105051	105252	Profile 9	1.9 - 4.0 kft	178	
105252	105354	Run 13	4.0 kft	178	run 13 fl40
105355	105548	Profile 10	4.0 - 6.0 kft	178	
105618	105710	Run 14	6.0 kft	206	run 14 fl60
105710	110045	Profile 11	6.0 - 10.0 kft	211	
110045	110154	Run 15	10.0 kft	196	run 15 fl100
110238		descent to 1000'	10.0 kft	193	
111358	123757	Run 16	0.92 - 0.80 kft	180	run 16 1000ft
111550		waypoint 76	0.94 kft	172	
114032		waypoint 79	0.87 kft	170	
114213		QNH 1019	0.88 kft	141	
115729		waypoint 80	0.88 kft	151	
121828		waypoint 87	0.83 kft	128	
121841		QNH 1021	0.82 kft	123	
122627		TW status light ON	0.80 kft	148	
123707		TW status 4094	0.80 kft	201	
123719		TW 'off'	0.80 kft	201	
123746		TW 'on'	0.80 kft	201	
123850	124319	Profile 12	0.82 - 5.0 kft	308	slow climb in plume
124302		TW restarted ok	4.7 kft	323	
124545		fl100 calibrations	10.0 kft	311	
130933		asps closed	2.4 kft	234	
131632		Land	0.22 kft	311	13:16:32
131928		power c/o	0.22 kft	311	


Analysis chart valid 12 UTC THU 14 JUL 2005
GEOSTROPHIC WIND SCALE
IN KNOTS FOR ISOBARS AT 4 MB INTERVALS
POLAR STEREOGRAPHIC PROJECTION
N
70
60
50
40
H 1016
L 1007
L 999
H 1016
L 1002
L 1005
L 1005
H 1021
L 1017
H 1033
H 1021
L 1012
L 1015
L 1011
Met Office
metoffice.gov.uk
© Crown copyright

B111 Track 14-JUL-05



Sortie Brief: AMPEP

Flight Number : B111

Mission Scientist: David Fowler, CEH

Date 14-July-2005

Outline schedule:

06:00 – Power to aircraft – warm-up
08:00 – Briefing
09:15 – Clear aircraft and security check
09:30 – Doors close
10:00 – Take off Cranfield
14:00 – Land Teesside for refueling;
15:30 – Take off Teesside
17:05 – Land Cranfield
17:35 - Debrief
19:05 – Power down

Location: Northbound followed by Southbound transect of the East Coast of England and Scotland

Sortie Aims: To measure the UK pollutant budget of a range of gases and aerosols leaving the UK in gentle Westerly airflow over northern Britain. The objective, in addition to measuring the export fluxes of pollutants is to derive the chemical processing (gas/aerosol partitioning & oxidation state) of the air mass in Westerly airflow over the UK. The frontal activity to the North and West limits the area of the UK over which we can work, and the lack of airflow over southern England restricts the work to areas north of Norfolk according to current forecasts.

Sortie Summary: The budget measurements will be obtained by flying off the East coast along a Northbound transect beginning off the coast of Norfolk, and ending at Wick, then after refueling (in Inverness) to return along the same path returning to Cranfield. Vertical profiles (50 – 6000 ft) once upwind at the North end of the transect and downwind of the source region off the Lincolnshire coast on the Southbound leg will provide the vertical structure in concentration and meteorology. These should clearly extend into the free troposphere (Mission Scientist to verify from profiles of humidity, temperature and CO. These measurements will establish the upwind concentration, the concentration differential at the top of the boundary layer and the concentration in the outflow from the source region. Flight ceiling will be 10000ft. Cabin pressure will be maintained at 1200ft, to minimize expansion of the Tedlar bags.

Sortie Detail with approx timing

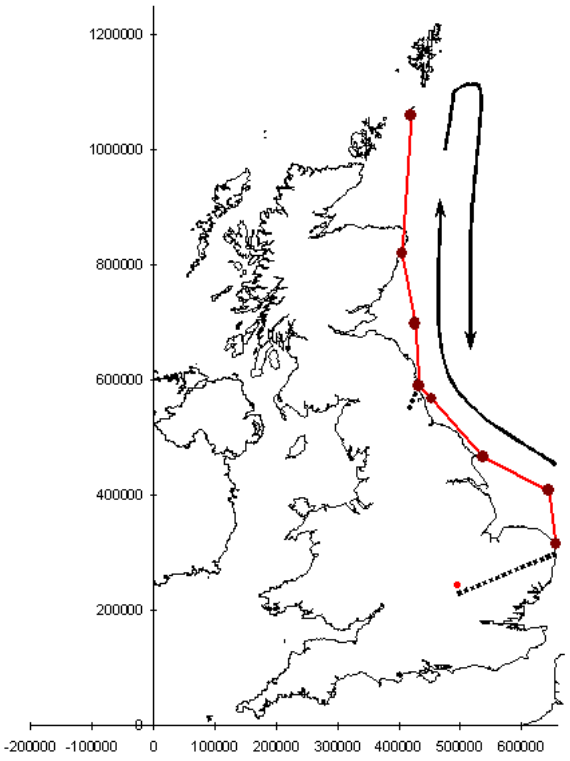
a) Take off Cranfield 10:00 and climb to 10000 ft for transit east to operating area. Destination waypoint 40 near East Anglia; background filter run & NOxy calibration.
b) T+20 Profile down to define the boundary layer structure off the coast with 1 min sampling at each height (6000, 4000, 2000, 1000, 500, 100)

c) T+35 Return to 1000 ft for sampling..
Start of filter run No 1. Start of Bag sampling (1 bag every min) continue all the way up the east coast.
d) T+160 background profile at point 74 (dip to 50ft, ascent at 1000 ft min^{-1}, level out at 100, 500, 2000, 4000, 6000 for 1 min each, approx. 15 min profile duration)
e) T+240 land Teesside
f) T+330 T/O Teesside
g) T+340 before leaving coast near WP87; downwind profile heading north (dip to 50ft, ascent at 1000 ft min^{-1}, level out at 100, 500, 2000, 4000, 6000 for 1 min each, approx. 15 min profile duration); followed by NOxy calibration
h) T+ 400 Land Cranfield

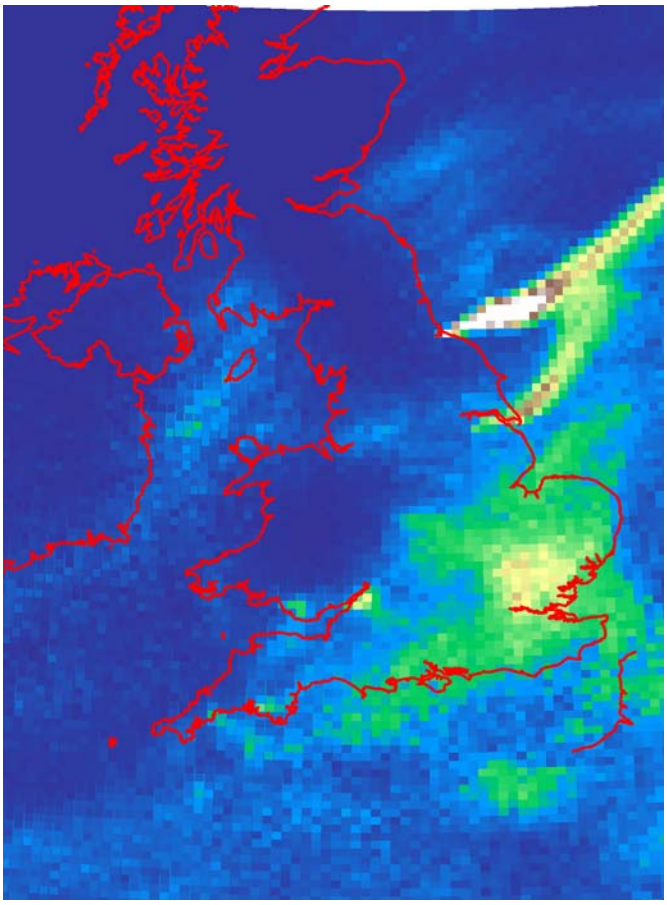
Crew List:

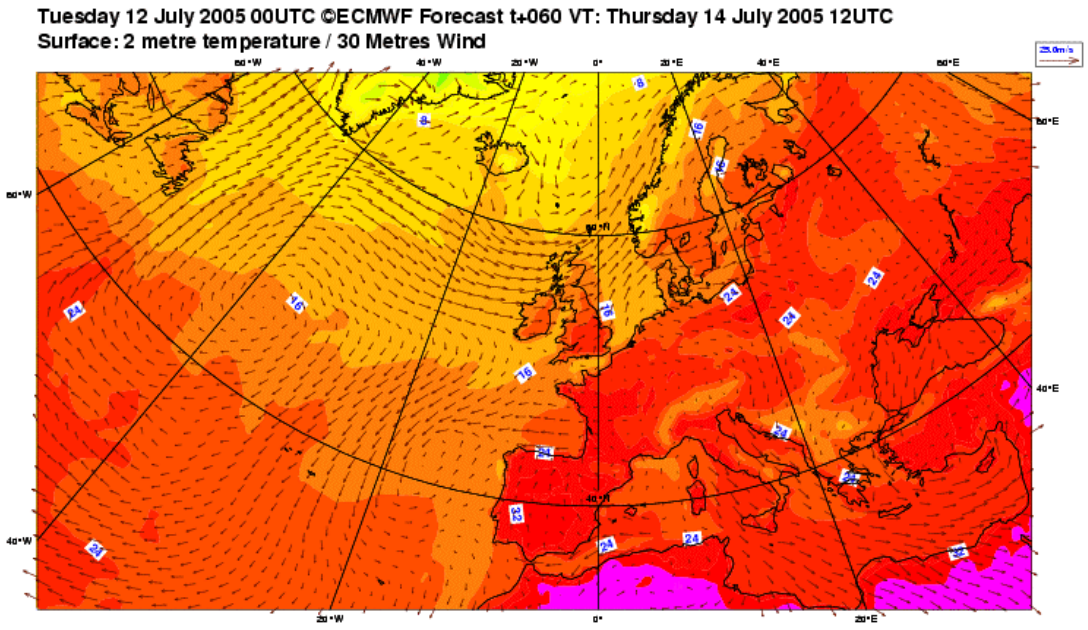
1. Pilot 1 - Alan Roberts
2. Pilot 2 – Alan Foster
3. CCM – Sue Angold
4. CCM 2 Steve Devereau
5. Cloud Physics – Martyn Pickering
6. CVI Paul James
7. Flight Manager – Jim Crawford
8. Mission Scientist – David Fowler
9. Core Chemistry/TDLAS/PAN – Ruth Purvis
10. Core Chemistry Training Maureen Smith
11. Filters – Steve Devereau
12. WAS – Maria Nielsdottir
13. Bag Sampling 1 – Alan McDonald
14. Bag Sampling 2 – Mark Theobald
15. AMS – Paul Williams
16. PTRMS – Anne Hulse
17. PTRMS–Training Jennifer Murphy
18. NOxy – Dave Stewart

MAPS:



Cranfield T/O 8:45
40
87
80
79
78
77
76
75
74
75
76
Refuel at Teesside
77
78
79
80
87
40
Cranfield land.





Instrumentation strategies & issues:

Filter sampling: Filters will be taken throughout the flight. Filter pack 1 will contain a Teflon filter for trace metal analysis. Filter pack 2 will contain a Teflon prefilter (for major ion analysis), a nylon filter (for HNO_3 & HCl) and an acidified paper filter (for NH_3). Filters will be changed approximately every 30 minutes or when flight conditions change (as advised by the Mission Scientist). Filters are preloaded into cartridges, which need to be handled with gloves and stored in sealed bags immediately. Filter sampling will be suspended during vertical profiles and resumed when FL10 is re-attained. During breaks, filter packs will be isolated by switching off the pump (to minimise evaporation of volatile aerosol components). During initial transfer to the operating area, a set of filters should be loaded into the filter packs, without sampling, to provide a blank value. Three 30-min runs of filters on each leg (S→N and N→ S)

AMS: The AMS will be operated continuously during the flight. Monitored masses will include m/z 16, 18, 28, 30, 43, 44, 46, 57 and 64. The inlet remains closed until airborne to minimize contamination during taxi take-off.

Core Chemistry: CO, SO_2, NO and NO_2 will be measured continuously during the flight. CO will be calibrated every 30 minutes at FL10.

Tedlar bags: Tedlar bags will be filled at a flow rate of 6 lpm, filling a bag over a duration of 30 s. Bags will be filled every 3 minutes upwind and every minute downwind of the source region and during each leveling out for a profile step. Bags should be filled to about 90% of their capacity to maximise sample volume. The cabin pressure will be tightly controlled. Bags from first part of flight can be stored in cargo hold for second part.

Aerosol & cloud physics: CN and PCASP are operated continuously.

Core meteorology & state: Are recorded as standard. Video recording of front facing and downfacing cameras.

PTRMS: Operation as normal.

NOxy: Operation as normal; calibration during transits at FL100

WAS: Sampling density and location to be decided.

TDL for CH_4 and CO_2: Operated by FAAM.

Quick-look data: pressure height, lat, long, temp, RH, CN, SO_2, NO, NO_2, O_3, CO

Mission Scientist De-Brief **Flight B111**

AMPEP **14th July 2005**

Take off from Cranfield at 08:37 climbing to 10,000ft and heading East to the Norfolk coast, during which NOxy calibration and background filter samples were taken during Run 1 beginning 08:45. Run 2 beginning 09:05, with bag filling at 6000ft provided background air samples, close to the Norfolk coast. Run 3 at 4000ft close to Cromer, Run 4 at 2000ft, Run 5 at 1000ft, Run 6 at 100ft.Climb to 1000ft for sampling the transect north as Run 7, at 09:19. The run was halted at 09:21 to climb to 5000ft and correct a problem with the AMS, off the Lincolnshire coast. The sampling at 100oft restarted at 09:26 with gentle westerly airflow. Plumes of SO_2 and NO_2 to 20ppb and 40 ppb respectively shortly before reaching the Teesside area. A series of distinct plumes of gaseous and particulate pollutants with a small background concentrations between each.

Visibility declining close to the Farne Isles as the 1000ft sampling continued north, towards WP76. Plumes of SO_2 and NO_2 in the Firth of Forth downwind of the Lothians and Cental Scotland. End of Run, north of Peterhead.

Profile sampling to define the vertical structure, 100ft, 1000ft, 2000ft, 4000ft, 6000ft at 10:56. Return to 1000ft for sampling on the southbound route along the coastline, as Run 16. The plumes of SO_2 and NO_2, on the return sampling were similar to those measured on the northbound route, and were particularly clear off Teesside, with SO_2 and NO_2 concentrations of 16ppb and 27 ppb respectively in the plumes. The plumes off the Yorkshire coast close to WP 80 were distinct and with high SO_2 relative to the NO_2 concentrations seem likely to be from the coal burning power stations in the Ferrybridge to Eggborough area. Sampling continued around the Lincolnshire and Norfolk coasts and south to Suffolk stopping close to the Sizewell Nuclear power station.

Return to Cranfield at 10000ft with NO_{xy} calibration during the transit, landing at Cranfield at approx 13:15.

David Fowler, CEH

1 B pw 10 AMS
WMS

Mission Scientist's Log

DFowler.

Flight No **B.111**..... Date 14 JULY 05 Page 1 of 4

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
0730					Flight briefing 0730 noted prev weather
					Noted of WP75. plan & profile at WP75
					and return along same route. Plan for
					3 filters N bound and 3 filters S bound.
GMT ↓					
0845					Prep & boarding
0930					Prep for take off Cranfield
0937					Take off Climb & 10K heading
0945	1	10k			Heading E to Norfolk Coast
1005	2	6k			Norfolk Coast Bag filling
1007	P2				profiling to 4k ~ Cromer
1010	3	4k			Bag filling at 4k ~ "
1011	P3				profiling to 2k Clear MORRIS BLAKENEY
1012	4	2k			
09:13	P4				profiling to 1k
09:15	5	1k			Bag + bottle filling
09:16	6	100ft			Profile to 100ft
					Climb to 1000 ft
19	7	1k			
09:21					End of Run AMS Cromer (Humber)
		5k			Climb to 5k & sort AMS
09 25					Return to 1023
09.29	8	1k			Approx Heading to N
09:38	8	1k			240° 8kt + gusts variable

Mission Scientist's Log

Drawer

Flight No **B** 111 Date 14-07-05 Page 2 of 4

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
09:42	8	1000	330		poor visibility with Hz
09:48	8	1000			plumes of SO_2 & 20ppb 40ppb NO_x
09:50	8	1000	320		coastline
09:52	8	1000	310		Newcastle bay + harbour
09:56	8	1000	310		Alnwick 7ppb NO_x 11ppb SO_2
09:59	8	1000	310		downwind Newcastle 10ppb NO, 0.5ppb SO_2
					Distinct plumes from 2 coastal towns
					low background - (as dec. 2007)
10:02	8	1000	300		1-2 ppb NO_x, 9ppb NO Farne Islands
10:09	8	1000	300		1-2 ppb NO_x, 8 ppb O_3
10:11	8	1000	300		Visib declining CB + Bamburgh
10:13	8	1000	300		WP76
10:18	8	1000	300		5ppb SO_2, 10 ppb NO_x downwind Celi
10:22	8	1000	300		Ashington, Newbiggin + Alnmouth downwind
10:26	8	1000	300		Aberdeen wind 250° 27kt
10:40	8	1000	320 330		50 m N Aberdeen, 0.2ppb NO_x, 0 ppb O_3
10:42	8a	1000			End of Run 8 descent to 100ft
10:45	9	100	180		level run, S
10:46	P6				profile to 500
10:46m	10	500	180		500ft run
10:47	P7				profile to 1000ft
10:48	11	1000	180		1000ft run (~0.1ppb NO_x)
10:49	P8				profile to 2000ft
10:50	12	2000	180		2000ft run (~0.1ppb NO_x)
10:51	P9		180		profile to 400ft

Mission Scientist's Log

D [illegible]

Flight No **B**...111... Date ...14-07-2005... Page ...3... of ...4...

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
10:52	13	4000	180		
10:53	P10				profile to 6000ft
10:56	14	6000	180		ozone at most 40ppb → 50ppb
10:57	P11				profile to 10kft [illegible]
11:00	15	10K	180		run at flight [illegible]
11:02					End of run
11:06	P12				descent to 1000ft for remaining
11:13	16	1000	170		Firth of Forth – [illegible] plume
11:22	16	1000	"		Farne Islands & Holy Island (SW [illegible]) [illegible]
11:28	16	1000	214		1ppb NO_x 10ppb O_3
11:34	16	1000	215		7ppb NO_x 1ppb NO, 13ppb O_3
11:36	16	1000			
11:40	16	1000	154		WP79 ·3 NO_2, 13ppb O_3
11:43	16	1000			Teesside 27ppb NO_x 16ppb SO_2 Max CO 1ppm
					A trailing [illegible] of plumes
11:48	16	1000	144		1ppb NO_x, 12ppb O_3 North Yorks coast
11:50	16	1000	143		Flamborough Hd
11:56	16	1000	144		Vis NO_x plume S. F. Hd WP80 [illegible]
11:59	16	1000	150		18ppb NO_x Wind 216° 11kts
12:01	16	1000	154		23ppb NO_x 20ppb SO_2 2[illegible]ppb CO
12:10	16	1000	157		Lincolnshire coast 2ppb NO_2, 20ppb O_3
12:16	16	1000	160		N Norfolk, 13ppb NO_2, 18ppb O_3
12:22	16	"	140		Cromer 2ppb NO_2
12:26	16	1000	147		S [illegible] 6ppb NO_2

Mission Scientist's Log

David Fowler

Flight No **B**111 Date 14-07-2005 Page 4 of 4

15 min transect to London plume ~50m (50 km)

GMT	Run / Profile	Height	Hdg	GPS Position	Remarks (clouds, weather, visibility, winds, sea state etc.)
12 25	16	1000	145		Sea Palling 6 ppb NOx
12.28	16	1000	151		Winterton 8 ppb NOx
12.30	16	1000			Gt Yarmouth 9 ppb large oxygenate AMS
12:32	16	1000	195		Lowestoft 12 ppb NOx
12:36	16	1000	194		7 ppb SO₂ NOx 6 ppb
12:36	16	1000	"		Sizewell 11 ppb SO₂
12:37	16	1000			End run
12.38	—				Climb to 10k sw Sizewell PS
12:38:5[illegible]	P12				Heading 325 back to Cranfield Heading
12.43		5000			End P12 deep Cu
12:54		10k			Return to Cranfield above few Cu
13:04		↓			descent to level on Cranfield for Wingrad

FLIGHT NUMBER: B111	DATE: 14.7.05	OPERATOR: ~~Doug Anderson~~	Page ~~2 of 2~~
PROJECT: AMPEP			

CORE CHEMISTRY CALIBRATION AND FLOW LOG

PREVIOUS CO CAL	Date and Flight Level	Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)

Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
08:56:55	100	69.97	97.57	6827	50.0	7.13
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
		33.80	0.65	0.65			0.344
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
693431	1000ft	71.92	97.17	6989	50	7.14
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
		33.82					
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
10:08:58	1000ft	72.96	95.85	6993.10	50.00	7.13
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
		33.74	9.0	9.0			0.14
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
10:39:08	1000ft	73.88	94.85	7008.80	50.00	7.13
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
		33.91	8.0	9.0			0.21
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
11:25:10	1000ft	74.93	93.49	7005.51	50.00	7.14
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
		33.69	11.0	11.0			0.39
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
≈ 1140 CO = 1538 ppb! sharp plume						
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
12:19:40	1000ft	75.43	91.84	6926.95	50.0	7.13
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_x Sample	NO_x Ozonator	SO2 Sample
		33.61	18.0	18.0			0.66

FLIGHT NUMBER Bill ~~B685~~	DATE: ~~10/2/04~~	OPERATOR: Maureen Smith ~~Beth Pundsack~~
PROJECT: ~~ARCTAS~~ AMPEP	1417/05	Page 2 of 2

CORE CHEMISTRY CALIBRATION AND FLOW LOG

Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
12:51:20	FL100	75.12	91.44	6869.05	50.00	7.14
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_X Sample	NO_X Ozonator	SO2 Sample
		33.85	20	23			0.24
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_X Sample	NO_X Ozonator	SO2 Sample
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_X Sample	NO_X Ozonator	SO2 Sample
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_X Sample	NO_X Ozonator	SO2 Sample
Time	Flight Level	CO				
		Sensitivity (Hz/ppbV)	Bkgrd (ppbV)	Bkgd Cnt R (Hz)	Lamp Temp (°C)	Cell Press (Torr)
		Flows (LPM unless stated)				
		CO Lamp Gas (ml/min)	Ozone Sample 1	Ozone Sample 2	NO_X Sample	NO_X Ozonator	SO2 Sample

CLOUD PHYSICS LOG

Flight No. B111 **Date: 09/08/05** **Operator: MAP** **Page 1 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
08:44:41											Start Run 1 @ FL100
08:45:00	20	0.07	0								Slight indication of PCASP noise
08:47:00	10	0.07									Slight indication of PCASP noise
08:49:00	15	0.09									Slight indication of PCASP noise
08:51:00	15	0.09									Slight indication of PCASP noise
08:53:00	80	0.10									
08:55:00	40	0.09									
08:57:00	35	0.09									
08:59:00	15	0.10									
09:00:58											End of Run 1
09:02:38	11	0.10									Start Profile 1 from FL100
09:03:29	70	0.09									FL090
09:04:21	300	0.09									FL080
09:05:25	400	0.09									FL070
09:06:37	550	0.10									End of P1 & Start Run 2 @ FL060
09:07:38											End Run 2 Start P2 from FL060
09:08:35	630	0.09									FL050
09:09:34	500	0.09									End of P2 Start Run 3 @ 4000’
09:10:28											End of Run 3 Start P3 from 4000’
09:11:29	700	0.09									3000’
09:12:38	660	0.09									End of P3 Start Run 4 @ 2000’
09:13:29											End of Run 4 Start P4 from 2000’
09:14:53	1200	0.09									End of P4 Start Run 5 @ 1000’
09:15:49											End of Run 5 Start P5 from 1000’
09:17:30	1000	0.08									End of P5 Start Run 6 @ 100’
09:18:30											End of Run 6
09:19:35											Start Run 7 @ 1000’
09:20:00	320	0.08									
09:21:38											End of Run 7
09:29:25											Start Run 8 @ 1000’
09:30:00	210	0.09									
09:32:00	210	0.08									
09:34:00	200	0.08									
09:36:00	380	0.09									

CLOUD PHYSICS LOG

Flight No. B111 **Date: 09/08/05** **Operator: MAP**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
09:38:00	410	0.09	0								
09:40:00	480	0.09									
09:42:00	365	0.09									
09:44:00	400	0.09									
09:46:00	380	0.09	overheat		3	800	1	16	2000	1	FFSSP switched off
09:48:00	400	0.09			7	800	1				09:47:30 PCASP peak of 1200
09:50:00	500	0.09									
09:52:00	480	0.09									
09:54:00	400	0.09									
09:56:00	390	0.09									
09:58:00	380	0.09									
10:00:00	400	0.09									
10:02:00	380	0.09									
10:04:00	465	0.09									
10:06:00	410	0.09									
10:08:00	400	0.09									
10:10:00	400	0.09									
10:12:00	335	0.10									FFSSP on
10:14:00	300	0.10									
10:16:00	330	0.10									
10:18:00	250	0.10									
10:20:00	130	0.10									
10:22:00	120	0.10									
10:24:00	25	0.10									
10:26:00	40	0.08									
10:28:00	60	0.08									
10:30:00	55	0.08									
10:32:00	80	0.08									
10:34:00	60	0.08									
10:36:00	140	0.14			10	800	1	150	1000	1	
10:38:00	75	0.08			2	800	1	200	1000	1	
10:40:00	50	0.09			2	800	1	100	1000	1	
10:42:00	60	0.14			3	800	1	110	1000	1	

CLOUD PHYSICS LOG

Flight No. B111 **Date: 09/08/05** **Operator: MAP** **Page 3 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
10:42:50			0								End of Run 8
10:44:55	65	0.09						75	1000	1	Start Run 9 @ 100’
10:45:43											End of Run 9 Start P6 from 100’
10:46:22	65	0.09									End of P6 Start Run 10 @ 500’
10:47:11											End Run 10 Start P7 from 500’
10:47:52	60	0.09						25			End of P7 Start Run 11 @ 1000’
10:48:45											End of Run 11 start P8 from 1000’
10:49:45	50	0.09	1					250	1000	1	End of P8 Start Run 12 @ 2000’
10:50:54											End of Run 12 Start P9
10:51:53	120	0.09	2		5	800	1	1000	1600	1	FL030
10:52:54	100	0.15	6		5	800	1	400	1400	1	End of P9 Start Run 13 @ 4000’
10:53:56											End of Run 13 Start P10
10:54:52	65	0.09	10		2	800	1	200	1800	1	FL050
10:55:48	45	0.10			20	700	1	75	600	1	End of P10 Start Run 14 @ 6000’
10:57:10											End of Run 14 Start P11
10:58:07	70	0.11	11		30	800	8	2000	2000	8	FL070
10:59:03	100	0.21	15		55	800	8	9000	1000	8	FL080
10:59:55	50	0.16	17		3	200	0				FL090
11:00:59											End Of P 14 start run 15 @ FL100
11:01:00	35	0.12			11	800	8				
11:02:38											End of Run
11:13:58											Start Run 16 @ 1000’
11:14:00	500	0.10	181								
11:16:00	400	0.10						75	1000	1	
11:18:00	500	0.13	183		1	800	1	35	1000	1	
11:20:00	540	0.10									
11:22:00	440	0.09									
11:24:00	550	0.10									
11:26:00	600	0.10									
11:28:00	400	0.09									
11:30:00	550	0.09			1	800	1	10			
11:32:00	600	0.12	185		1	800	1	260	2800	1	
11:34:00	560	0.09	188		1	800	1	150	1000	1	

CLOUD PHYSICS LOG

Flight No. B111 **Date: 09/08/05** **Operator: MAP** **Page 4 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
11:36:00	580	0.10	198		2	800	1	550	800	1	
11:38:00	320	0.09	201					30			
11:40:00	420	0.09									
11:42:00	465	0.09									
11:42:10	1800	0.09									Plume
11:44:00	470	0.09									
11:46:00	450	0.09									
11:48:00	510	0.09	Overheat								FFSSP switched off
11:50:00	430	0.09									
11:52:00	430	0.09									
11:54:00	460	0.09									
11:56:00	350	0.08									
11:58:00	420	0.08									
12:00:00	380	0.09									
12:02:00	490	0.08									
12:04:00	400	0.09									
12:06:00	400	0.09									
12:08:00	435	0.08									
12:10:00	490	0.08									
12:12:00	300	0.08									
12:14:00	200	0.08									
12:16:00	500	0.08									
12:18:00	745	0.08									FFSSP On
12:20:00	860	0.08									
12:22:00	1000	0.08									
12:24:00	1400	0.08									
12:26:00	1350	0.08									
12:28:00	1150	0.08									
12:30:00	980	0.08									
12:32:00	810	0.08									
12:34:00	1000	0.08									
12:36:00	1000	0.07	Overheat								FFSSP switched off
12:37:54	250	0.07									End of Run 16

CLOUD PHYSICS LOG

Flight No. B111 **Date: 09/08/05** **Operator: MAP** **Page 5 of 5**

G.M.T.	PCASP		FSSP	SID1	2D2-C			2D2-P			Remarks
DRS Time	Conc/cc	Mean R	Block Transfer	Particle Count	Conc/L	Max Size	Habit	Conc/m3	Max Size	Habit	
12:39:13	380	0.07	Switched on								Start Profile 12 from 1000’
12:40:27	500	0.07	202								FL020
12:41:23	610	0.08									FL030
12:42:18	450	0.08									FL040
12:43:18	460	0.09									End of Profile 12 @ FL050
	SEADAS Time offset = 0										
	PCASP may show some noise at start of flight										
	PCASP flow rate = 0.6										
	SID 1 not fitted SID 2 computer fails										
	FFSSP overheat on occasions. Switched off for small periods to cool										

Filter Sampling Log

Flight No: B111 **Date: 14/07/20005** **Operator:PAPJ**

Run No	Disk No 1	Disk No 2	Disk No 3	Top/ Bottom	Time On	Time Off	Flight Run	Accum Vol [l]	Comments
1	145	91	81	T	09:20				DISCARDED
1	151	158	50	B	09:20	Water in filter holder?			“
8	126	87	136	T	093035	100000		3397	
8	23	111	127	B	093035	100000		0397	
8	150	141	155	T	100445	103445		3403	
8	101	131	130	B	100445	103445		0426	
	58	?	152	T	111430	114430		1066	
	133	21	88	B	111430	114430		0489	
	125	140	92	T	114900	121930		1103	
	95	100	83	B	114900	121930		0446	
	139	54	116	T	122430	123845		0504	
	51	108	89	B	122430	123845		0232	

AMS Inflight Log Sheet v2.00

DATE: 14/7/05 FLIGHT: B111 OPERATOR: PW/GC.

Time	Event
8 42 ish	Inlet open, Takeoff, Logging.
8 48	Prog stopped, pulling file 0000 (Running 8 49 Autofire off).
8 53	Speed 1506 / 1595 1595 ?.
8 56	Filter off; Running 857.
0907	AMS crashed; logging resumed 0923
1246	Stopped logging.
1247	Logging with filter at FL100 (non-autosaving)
1257	Forced more auto Run 2023
1258	Running in some alt with filter + Auto save & Condensor
13:20	stopped logging
13:21	started filter) inn.
13:32	Stopped. File 2068.

run 1596 0855

Flight No. B111 Route

Date 14/7/2005 Take Off 08:30 GMT

Bag Samplers: A McDONALD, M. THEOBALD

Sheet No. 1

Bag Number	Time on (GMT)	Time off (GMT)	Lat	Lon	Comments
264	—	—			TEST BAG
270	08:48:10	08:48:40	52.5N	0.3E	RUN 1 START
236	08:51:00	08:51:30			10000 FT
395	08:54:00	08:54:30			
487	08:57:00	08:57:30			END OF RUN 09:00:00
837	09:03:50	09:04:20	52.7N	1.7E	START OF DESCENT PROFILE ~9.3kft
212	09:06:45	09:07:15			6000 ft
536	09:09:40	09:10:10			4000 ft
485	09:10:40	09:11:10			BETWEEN 4000-3000ft
216	09:12:40	09:13:10			2000 ft
217	09:13:37	09:14:07			BETWEEN 2000-1000ft
490	09:15:00	09:15:30			1000 ft
234	09:17:30	09:18:00	53.3N	0.7E	100ft END OF PROFILE RUN
269	09:20:00	09:20:30			START OF RUN 7
201	09:21:00	09:21:30			
483	09:26:00	09:27:00			1 MIN FILL, LOW FLOW ABOVE 1000ft
340	09:29:30	09:30:00			START OF RUN, LOW FLOW
528	09:30:30	09:31:00	53.9N	0.1E	
327	09:31:30	09:32:00			
207	09:32:30	09:33:00			WAYPOINT 80
321	09:33:30	09:34:00			
533	09:34:30	09:35:00			
261	09:35:30	09:36:00	54.1N	0.0E	
237	09:36:30	09:37:00			
211	09:37:30	09:38:00			
262	09:38:30	09:39:00			
204	09:39:30	09:40:00			
488	09:40:30	09:41:00			
235	09:41:30	09:42:00			
268	09:42:30	09:43:00			
338	09:43:30	09:44:00	54.5N	0.6W	
529	09:44:30	09:45:00			
335 ?	09:45:30	09:46:00			
527	09:46:30	09:47:00			
328	09:47:30	09:48:00			
220	09:48:30	09:49:00	54.8N	0.9W	
486 ?	09:49:30	09:50:05			1min 05 sec
333	09:50:30	09:51:00			
540	09:51:30	09:52:00			
266	09:52:30	09:53:00			
477	09:53:30	09:54:00	55.0N	1.1W	

Flight No. B111 Route

Date 14/07/2005 Take Off 0830 GMT

Bag Samplers: A. MCDONALD M. THEOBALD

Sheet No. 2

Bag Number	Time on (GMT)	Time off (GMT)	Lat	Lon	Comments
504	09:54:31	09:55:00			29 sec FILL
322	09:55:30	09:56:00			
530	09:56:30	09:57:00			
323	09:57:30	09:58:00			
219	09:58:30	09:59:00	55.3N	1.2 W	
326	09:59:30	10:00:00			
471	10:00:30	10:01:00			
263	10:01:30	10:02:00			
481	10:02:30	10:03:00			
334	10:03:30	10:04:00			
332	10:04:30	10:05:00	55.7N	1.4 W	WAYPOINT 77
267	10:05:30	10:06:00			
532	10:06:30	10:07:00			
225	10:07:30	10:08:00			
399	10:08:30	10:09:00			
393	10:09:30	10:10:00	55.9N	1.7W	
510	10:10:30	10:11:00			
391	10:11:30	10:12:00			
476	10:12:30	10:13:00			WAYPOINT 76
503	10:13:30	10:14:00			
210	10:14:30	10:15:00	56.2N	1.8 W	
206	10:15:30	10:16:00			
329	10:16:30	10:17:00			
507	10:17:30	10:18:00			
231	10:18:30	10:19:00			
331	10:19:30	10:20:10			
312	10:20:30	10:21:00	56.6N	1.8 W	
226	10:21:30	10:22:00			
230	10:22:30	10:23:00			
265	10:23:30	10:24:00			
311	10:24:30	10:25:00			
544	10:25:30	10:26:00			
218	10:26:30	10:27:00			
205	10:27:30	10:28:00			
542	10:28:30	10:29:05			[redacted] 35s FILL
408	10:29:30	10:30:00			
223	10:30:30	10:31:00			
215	10:31:30	10:32:00			
208	10:32:30	10:33:08			
[redacted] 233	10:33:30	10:34:00			
209	10:34:34	10:35:05			

Flight No. B11 Route

Date 14/07/05 Take Off 0830

Bag Samplers: A. McDONALD M. THEOBALD

Sheet No. 3

Bag Number	Time on (GMT)	Time off (GMT)	Lat	Lon	Comments
238	10:35:30	10:36:00			
546	10:36:30	10:37:00			
213	10:37:30	10:38:04	57.7N	1.7W	
482	10:38:30	10:39:00			
494	10:39:30	10:40:00			
502	10:40:32	10:41:02			
458	10:41:32	10:42:02			
382	10:42:40	10:43:10	58.0N	1.7 W	END OF RUN
459	10:45:00	10:45:30			100 ft ASCENDING PROFILE
509	10:46:25	10:46:55			500ft
397	10:47:15	10:47:45			~~1000~~ 500-1000ft
386	10:48:00	10:48:30			1000ft
339	10:48:50	10:49:20			1000 - 2000 ft
526	10:49:50	10:50:20			2000 ft
202	10:51:00	10:51:30			2000 - 4000 ft
478	10:53:00	10:53:30			4000 ft
522	10:54:00	10:54:30			4000 - 4700 ft
543	10:55:50	10:56:20			6000 ft
460	10:57:30	10:58:00			6300 - 7100 ft
475	11:00:50	11:01:20			10,000ft
548	11:14:00	:30			Run to 1,000N
330	15:00	:30			
390	16:00	:30	56.1N	1.7W	
396	17:00	:30			
473	18:00	:30			
508	19:00	:30			
387	20:00	:30			
400	21:00	:30			
505	22:00	:30			
473	23.00	:30			
381	24:00	:30	55.6	1.4W	
392	25:00	:30			
384	26.00	:30			
385	27:00	:30			
383	28:00	:30			
409(?)	29:00	:30			
474	11:30:00	:30			
388	31:00	:30			
~~398~~ 398	32:00	:30			= on label
282	33:00	:30			
557	34:00	:30			

TUBE Spot

Flight No. B111 Route

Date 14/7/2005 Take Off 08:30

Bag Samplers: A MCDONALD, M THEOBALD

Sheet No. 4

Bag Number	Time on (GMT)	Time off (GMT)	Lat	Lon	Comments
078	11:35:00	35:30			
024	36:00	36:30	55.0	1.0 W	
658	37:00	37:30			
518	38:00	38:30			
545	39:00	39:30			
250	40:06	40:36			
394	41:00	41:30			
501	42:00	42:30			
389	43:00	:30			
407	44:00	:30			
004	45:00	:30			
436	46:00	:30			
285	47:00	:30	54.5	0.5W	
652	48:00	:30			
380	49:00	:30			
119	50:00	:30			
132	51:00	:30			shift value on bag?
073	52:46	:15			
010	53:00	:30			
170	54:00	:30			
145	55:00	:30			
022	56:00	:30			
613	57:00	:30			Waypoint 80
079	58:00	:30			
122	59:00	:30			
651	1200:00	1200 :30			
650	01:00	:30			
085	02:00	:30			
080	03:00	:30			
124	04:00	:30	53.7	0.3E	
060	05:00	:30			
525	06:00	:30			
506	07:00	:30			
450	08:00	:30			
166	09:00	:30			
143	10:00	:30			
378	11:00	:30			
428	12:00	:30			
142	13:00	:30			
164	14:00	:30			
559	15:00	:30			

Flight No. B111 Route

Date 14/7/2005 Take Off 07:30

Bag Samplers: A. MCDONALD H THEOBALD

Sheet No. 5

Bag Number	Time on (GMT)	Time off (GMT)	Lat	Lon	Comments
146	12:16:00	:30	53.0	0.9E	
379	:17:00	:30			Waypoint 87
141	:18:00	:30			
376	19:00	:30			
461	20:00	:30			
163	21:00	:30			
174	22:00	:30			
149	23:00	:30			
168	24:00	:30			
147	25:00	:30			
OLD 262	26:00	:30			
455	27:00	:30	52.7	1.7E	
288	28:00	:30			
184	29:00	:30			
077	30:00	:30			
190	31:00	:30			
039	32:00	:30			
049	33:00	:30			
177	34:00	:30			
426	35:00	:30			
016	36:00	:30			
363	37:00	:30			
068	39:30	40:00			Slow Climb
028	40:30	41:00		~3000ft	to 10,500ft
040	41:30	42:00		~3500ft	
470	42:30	43:00		~4500ft	

WAS Sampling Summary

Flight Number: B111

Campaign Name: AMPEP

Date: 14/07/2005

Operator: M. Neilsdottir (UEA)

Bottle Start Fill Time	Bottle End Fill Time	Bottle Number	Comments	Final Pressure (bar)
9:07:42	9:08:29	16	Run 2 at 6000 ft	3.20
09:09:31	9:10:16	17	In profile	3.27
09:10:34	9:11:19	18	Run 3 at 4000 ft	3.27
09:13:36	9:14:21	19	Run 4 at 2000 ft	3.34
09:15:50	9:16:30	20	Run 5 at 1000 ft	3.34
09:18:27	9:19:07	21	Run 6 at 100 ft	3.36
09:21:35	9:22:35	22	Run 7	3.35
09:31:28	9:32:28	23	Run 8 at 1000 ft	3.36
09:44:18	9:45:18	24	Run 8 at 1000 ft	3.36
09:48:26	9:48:56	25	Run 8 at 1000 ft high Sulphur	3.33
09:49:08	9:49:39	26	Teeside	3.33
09:59:36	10:00:06	27	High NOxy, peak on sulphur	3.30
10:00:22	10:00:52	28	High NOxy, peak on sulphur	3.33
10:10:07	10:10:37	29		3.34
10:19:37	10:20:07	30	Downwind from Edinburgh	3.34
10:34:06	10:34:36	31		3.34
10:39:47	10:40:17	32	High organics from AMS	3.33
10:45:53	10:46:33	49	Run 9 (100 ft)	3.36
10:47:17	10:47:57	50	Run 10 (500 ft)	3.35
10:48:54	10:49:34	51	Run 11 (1000 ft)	3.35
10:50:44	10:51:24	52	Part Run 12	3.34
10:56:46	10:57:26	53	Run 14 (6000 ft)	3.34
11:15:43	11:16:23	54	Run 16 high NOxy (zero AMS)- same plume as caught on way up?	3.35
11:17:27	11:18:07	55	Core chemistry indicates pollution	3.34
11:27:58	11:28:38	56		3.36

11:41:03	11:41:43	57	1000 ft	3.35
11:43:51	11:44:31	58	High CO (up to 1 ppm)	3.35
11:44:37	11:45:07	59	High CO (up to 1 ppm)	3.35
12:00:15	12:00:45	60	High NOx (ppb)	3.10
12:03:18	12:03:48	61	High NO2 (14 ppb); High CO (~200)	3.00
12:15:02	12:015:32	62		3.30
12:32:15	12:32:46	63	Plume? (Possibly London plume)	3.30
12:34:57	12:35:27	64	NOxy levels lower but CO rising	3.34

Flight Manager's Instrument Status Log

Flight No. **B**111 Date: 14/07/05

Instrument	Fitted	Operated	Instrument	Fitted	Operated
Navigation			**Cloud Physics**		
INU		**Y**	**Probes**		
XR5M GPS		**Y**	FFSSP		**Y**
Cruciform GPS		**Y**	PCASP		**Y**
Satcom C		**Y**	2D-P		**Y**
Satcom H		**Y**	2D-C		Y
Thermometers			Cloudscope	**N**	**N**
De-Iced Temp		**Y**	SID 1	**N**	
Non De-Iced		**Y**	SID 2	**y**	**Y**
Heimann	**N**		HVPS	**N**	
Hygrometers			CIP25	**Y**	**N**
G. Eastern		**Y**	CIP100	**Y**	**N**
J. Williams		**Y**			
Nevzorov		**Y**			
TWC		**Y**			
FWVS	**Y**	**N**	**Racks:**		
Radiometers			INC	**Y**	**N**
Upper Clear	**Y**	**Y**	CCN / CNC		**Y**
" Red	**Y**	**Y**	CVI		**Y**
" Silicon	**Y**	**Y**			
" JO1D	**Y**	**Y**	**Aerosol**		
Lower Clear	**Y**	**Y**	PSAP	**Y**	**N**
" Red	**Y**	**Y**	Nephelometer	**N**	
" Silicon	**Y**	**Y**	Filters	**Y**	**y**
" JO1D	**N**		AMS	**Y**	**Y**
Large Radiometers					
TAFTS	**N**				
MARSS	**N**				
DEIMOS	**N**		**Others:**		
ARIES	**N**		NIR TDLAS	Y	y
SWS	N		2BT O3	Y	N
Chemistry			VACC	Y	N
Ozone	Y	Y	PEROXIDE	Y	N
SO	y	y	Formaldehyde	Y	N
NOX	Y	Y	ADA	Y	Y
CO	Y	Y	CPI	Y	Y
ORAC	Y	N	NOxy	Y	y
PAN	Y	y	PTRMS	Y	y
PERCA	N	N	Bag Sampling	Y	y
WAS	Y	y			

Faults / Incidents Log

Flight No. B111
Date: 14/07/05

Instruments

1. Video – inboard recorder screen in standby
2. TW status light came on late in flight – recycled power – returned to normal working
3. AMS computer crashed once – successfully restarted
4. SO2 system not connected into HORACE – data logged manually
5. Possible flow problem with filter pack – low flow with some packs
6. SID1 not fitted, SID2 under trial
7. All other instruments performed well

Aircraft

1. Intercom box on Sooty/neph rack is intermittent on TX (reported to Avalon)

Flight extended by 20 minutes to take advantage of good science opportunity downwind of London.

MISSING LOG SHEETS:

The following logs are not available for flight B111:

Log	**Reason**
NOxy	No log is ever taken for NOxy
PTrMS	No log is ever taken for PTrMS
CVI	No log is ever taken for CVI
PAN	No log taken or no copy left with FAAM